

Improved Large Segmented Optics Fabrication Using Magnetorheological Finishing, Phase I

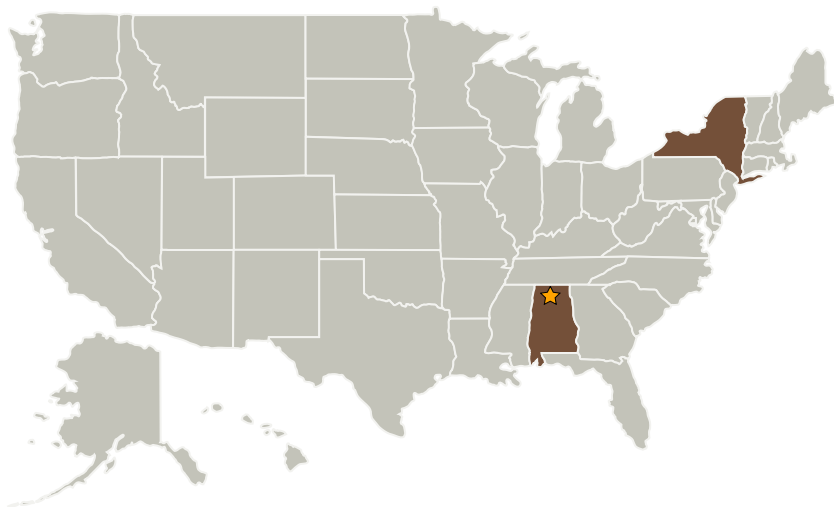
Completed Technology Project (2004 - 2004)



Project Introduction

Primary mirrors for large aperture telescopes ($>10\text{m}$) are collections of smaller (1-2m), typically hexagonal, often aspheric, optical segments. NASA's next generation specifications demand high precision optical surfaces with practically zero edge exclusion in order to maximize image contrast and resolution. Magnetorheological finishing (MRF) is a sub-aperture process demonstrated to be effective for fine figure control and polishing of a variety of optical glasses and crystals. The relatively small size and high removal rate of the MRF tool could allow efficient correction of "print-through" patterns (or other mid-spatial frequency errors) often observed after conventional polishing. MRF, however, suffers from edge effects, because the MRF polishing spot changes as it moves over the edge of the part. Current control algorithms assume the spot remains constant, resulting in edge errors on the order of half of the spot size in width. This proposed effort, therefore, is directed at improving the edge performance of the MRF process, through development of novel software algorithms, improved process methods and/or hardware improvements. This will be an essential part of a low cost solution for efficient fabrication of large lightweight optics.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Marshall Space Flight Center (MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
QED Technologies, Inc.	Supporting Organization	Industry	Rochester, New York

Primary U.S. Work Locations

Alabama	New York
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Paul Dumas

Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
 - └ TX11.4 Information Processing
 - └ TX11.4.8 Edge Computing